

On the knowledge of *Bembecia rushana* Gorbunov, 1992 and some related species (Lepidoptera: Sesiidae)

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Abstract. During several expeditions in Tajikistan (Central Asia) numerous specimens of a species of *Bembecia* Hübner, 1819 were collected which were initially identified as *B. karategina* Špatenka, 1997. On subsequent comparison with the type specimens of several Central Asiatic species, these specimens proved conspecific with *Bembecia rushana* Gorbunov, 1992, which was also described from Tajikistan. Therefore, based on morphological characteristics, genitalia morphology, DNA analysis and rearing results, *B. karategina* is considered here to be a subjective junior synonym of *Bembecia rushana*. In addition to the typical yellow specimens, black specimens of both sexes have also been found and are described here for the first time. During the examination of the type specimens it became clear that the female paratype (“allotype”) of *B. karategina* was misidentified. It belongs to *Bembecia hissoresensis* Stalling, Bartsch, Garrevoet, Lingenhöle & Altermatt, 2011 and is hitherto the only known female specimen of this species. Records of *B. rushana* from Afghanistan refer to *Bembecia salangica* Špatenka & Reshöft, 1989.

Zusammenfassung. Während verschiedener Expeditionen in Tadschikistan (Zentralasien) konnten zahlreiche Exemplare einer Art von *Bembecia* Hübner, 1819 gesammelt werden, die zunächst als *B. karategina* Špatenka, 1997 bestimmt wurde. Ein späterer Vergleich dieser Tiere mit den Typusexemplaren verschiedener zentralasiatischer Arten der Gattung erwies deren Artgleichheit mit *B. rushana* Gorbunov, 1992, die ebenfalls aus Tadschikistan beschrieben wurde. Basierend auf äußeren Merkmalen, der Genitalmorphologie und der DNA-Analyse sowie den Zuchtergebnissen wird *B. karategina* hier als subjektives jüngeres Synonym von *B. rushana* angesehen. Neben typischen gelben, konnten auch schwarze Exemplare beiderlei Geschlechts gefunden werden, die hier erstmals beschrieben werden. Bei der Untersuchung der Typusexemplare zeigte sich weiterhin, dass der weibliche Paratypus (“Allotypus”) von *B. karategina* fehlbestimmt wurde. Er gehört *Bembecia hissoresensis* Stalling, Bartsch, Garrevoet, Lingenhöle & Altermatt, 2011 an und stellt das einzige bisher bekannt gewordene Weibchen dieser Art dar. Meldungen von *B. rushana* aus Afghanistan betreffen *B. salangica* Špatenka & Reshöft, 1989.

Résumé. Au cours de plusieurs expéditions en Asie centrale (Tadjikistan) un grand nombre d'exemplaires d'une espèce de *Bembecia* Hübner, 1819 a été recueilli. Ils ont d'abord été identifiés comme *B. karategina* Špatenka, 1997. Ensuite, la comparaison avec les spécimens types de plusieurs espèces de l'Asie centrale a prouvé que ces exemplaires sont conspécifiques avec *Bembecia rushana* Gorbunov, 1992, également décrit du Tadjikistan. Par conséquent, basé sur des caractéristiques externes, la morphologie génitale, les analyses d'ADN et les résultats d'élevage, *B. karategina* est considéré ici comme synonyme subjectif junior de *Bembecia rushana*. À côté des exemplaires typiquement jaunes aussi des spécimens noirs des deux sexes ont été trouvés qui sont décrits ici pour la première fois. Pendant l'examen des spécimens types, il est devenu clair que la femelle paratype (“allotype”) de *B. karategina* a été mal identifiée. Elle appartient à *Bembecia hissoresensis* Stalling, Bartsch, Garrevoet, Lingenhöle & Altermatt, 2011 et représente jusqu'ici le seul spécimen femelle connu de cette espèce. Les données de *B. rushana* de l'Afghanistan appartiennent à *Bembecia salangica* Špatenka & Reshöft, 1989.

Introduction

The apparently monophyletic genus *Bembecia* Hübner, 1819, with 103 described species, is one of the largest genera of the clearwing moth family. It has its centre of distribution in the south-western part of the Palaearctic region with hot spots in the Mediterranean area and in Central Asia. All species of the genus have a reduced, non-functional proboscis and their larvae develop over one or two years in the roots or lower parts of the stems of various species of Fabaceae.

In multiple expeditions to the Hissar-Alai in Tajikistan, the authors captured extensive series of several *Bembecia* species. The majority were males, which were attracted by various synthetic pheromones, but females and early stages of many species were also found. Some of them proved to be new to science and have since been described (Garrevoet & Garrevoet 2011; Garrevoet & Lingenhöle 2011; Lingenhöle & Bartsch 2011; Stalling et al. 2010, 2011). The commonest species in many places was initially determined as *B. karategina* Špatenka, 1997, according to the “Handbook of Palaearctic Macrolepidoptera” (Špatenka et al. 1999). This species was originally described from a male – which is the holotype – and a female specimen from the southern Hissar-Alai, which were denoted as “found in copula”. Nevertheless, they are so different in appearance that the presumption arose that they must belong to different species. During subsequent research to solve this problem the authors came across another *Bembecia* species, also described from Tajikistan, *Bembecia rushana* Gorbunov, 1992. This species was also described from two specimens, a male and a female. Some confusion exists regarding its types, because two descriptions with conflicting type designation have appeared in the literature. In “Entomologicheskoe Obozrenie” (Gorbunov 1992a), which was “approved for printing” on 14 April 1992 and received in the library of ZIN on 29 July 1992 indicating an intermediate publication date, the female is designated as the holotype. In the other paper, published in “May 1992” in “Atalanta” and received in the library of SMNS on the 11th of June 1992, the male is selected (Gorbunov 1992b). A search through the archive of “Entomologicheskoe Obozrenie” did not provide any clarification on the exact publication date (Sinev pers. com.). At present we follow Špatenka et al. (1999) and consider the description in “Entomologicheskoe Obozrenie” as valid, making the female the holotype. Unfortunately, the labelling of the specimens follows the publication in “Atalanta”, in contrast to that of the genitalia slides.

The aim of this paper is to clarify the taxonomic status of *B. karategina* and *B. rushana* and to provide short notes on *B. hissorensis* Stalling, Bartsch, Garrevoet, Lingenhöle & Altermatt, 2011 and *B. salangica* Špatenka & Reshöft, 1989.

Materials and Methods

Most of the male specimens were collected using a synthetic pheromone originating from PRI (Plant Research International, Wageningen, The Netherlands) which contains (Z,Z)-3,13-Octadecadienyl acetate and (E,Z)-3,13-Octadecadienyl acetate in a 1:9 ratio. A few specimens were attracted to an old pheromone, with an unknown compo-

sition, for *Synanthedon myopaeformis* (Borkhausen, 1789) from the company BASF (Germany). Some individuals, including several females, were netted without the use of pheromones. A number of specimens of both sexes were also reared from larvae or pupae. Infested plants had to be dug out from the hard and stony soil very carefully. During the expedition, roots with larvae and pupae were kept in small containers. Once home they were placed indoors in terrariums containing a fine moderately moistened 5–7 mm grain hydroculture granulate and sprayed daily to maintain a sufficiently high humidity but avoiding the growth of mould. Most of the type specimens were examined and photographically documented. Preparations of genitalia of several specimens were made using the standard techniques: maceration of the abdomen in 10% KOH, removal of the scales and cleaning in 70% ethanol. Genitalia of males were not stained, and those of females were stained with Chlorazol Black, then embedded in Euparal on a cavity slide, males with opened valvae. DNA was extracted from a midleg of set specimens. DNA analysis (“Barcode” = 658 base pair sequences of mitochondrial COX1 gene) of several Tajik and Afghan *Bembecia* specimens including the types of *B. karategina* was carried out. The PCR primers used were LepF1 and LepR1; the distance model was Kimura 2 Parameter. For details see the “Barcode of Life Database” (BOLD) web page (<http://www.barcodinglife.com/views/login.php>). The detailed data can be accessed with a login under the project “Global Sesiidae – Clearwing Moths of the World”.

Abbreviations

ZMKU	Zoology Museum Kiev University, Ukraine
MWM	Museum Witt München
USPU	Ulyanovsk State Pedagogical University
ZIN	Zoological Institute St. Petersburg, Russia
CTG	collection of T. & W. Garrevoet
CDB	collection of D. Bartsch
CAL	collection of A. Lingenhölle

Results

In addition to the yellow specimens of *B. rushana* found in all localities where the species was recorded, a further expedition to the Peter the First Range at the north-western part of the Pamir Mountains resulted in the discovery of a population with predominantly normal yellow-coloured and occasionally almost black males. DNA analysis showed only small divergences between this population and those of the Hissar-Alai (2.9 %) and no significant morphological differences have been found. Towards the end of this trip an undetermined *Astragalus* L. (Fabaceae) plant, containing fully developed Sesiidae pupae, was found on the southern slopes of the Anzob Pass north of Dushanbe. Shortly afterwards a few specimens of both sexes emerged, including black and normal yellow-coloured females. The striking similarity of the external morphological characteristics of the males, including the types of *B. rushana* and *B. karategina*, the reared

yellow females and the female paratype of *B. rushana*, together with the structure of the genitalia of both sexes and the unambiguous results of the DNA barcode analysis (Fig. A1) led to the conclusion that *B. rushana* and *B. karategina* are conspecific. Hence, *Bembecia karategina* becomes a subjective junior synonym of *B. rushana*. The appearance of the yellow females is also very different from that of the female paratype of *B. karategina*. Therefore, the doubt about the correct identity of the latter specimen proved to be justified. Furthermore, both sexes of the reared specimens agree well with the original figures of *B. rushana* from the south-western Pamir Mountains, but the females differ significantly from the Afghan specimen representing *B. rushana* in the “Handbook of Palaearctic Macrolepidoptera” (Špatenka et al. 1999) and cited by Bartsch & Špatenka (2010). The external appearance as well as the DNA barcode of the female paratype of *B. karategina* support the already existing presumption it belongs to *B. hissoirensis*. The Afghan specimens from the Anjuman Pass, Hindu Kush Mountains, Afghanistan, which are mentioned and illustrated as *B. rushana* in the “Handbook of Palaearctic Macrolepidoptera” (Špatenka et al. 1999), belong to *B. salangica*. This conclusion is also supported both by the DNA results and the external morphology of the imagoes. The hitherto unknown black forms of both sexes of *B. karategina* are described below.

Bembecia rushana Gorbunov, 1992

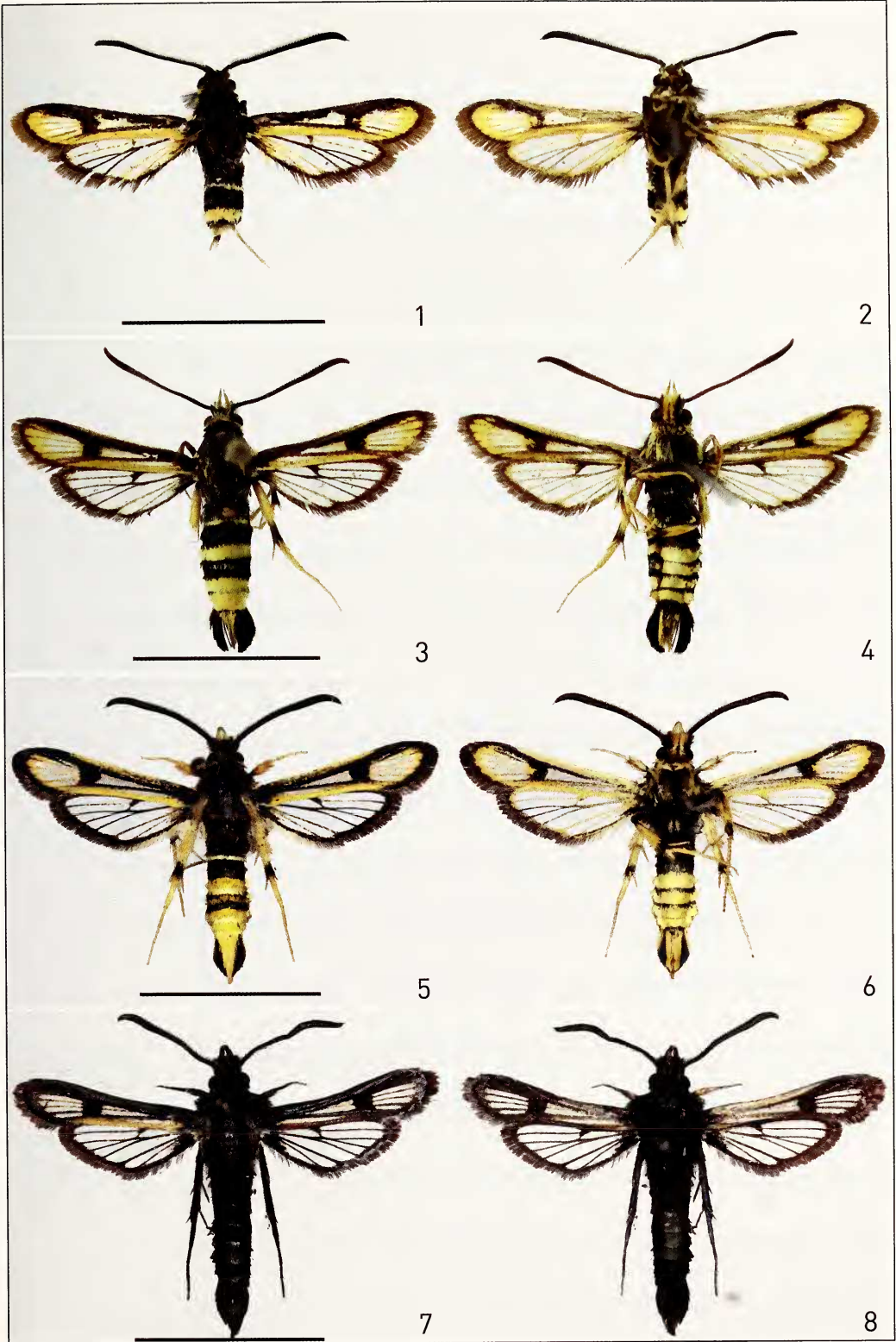
Figs 1–14, 22–29

Bembecia rushana Gorbunov, 1992a: 132. Type locality: Tajikistan, Pamir Os., Rushan, Jugum, Jazgulem, fauces fl. Rav-dara, 3300–3400 m. Holotype: female (ZMKU).

Bembecia karategina Špatenka, 1997: 33 **syn. n.** Type locality: Tajikistan, Karategin range, Romit valley, N 38.40°, E 69.10°, 1500 m. Holotype: male (MWM).

Material. Holotype ♀ (Figs 9, 10, 28), ‘Rushan (Pamir oc.) | Jugum Jazgulem | fauces fl. Rav-dara | 3300–3400 m alt., 29 VII 1937 | L. Sheljuzhko et N. Pavlitzkaja leg. | Mus Zool Univers Kijev.’, ‘rushana Shel, | (holotyp.) | ♀ L. Sheljuzhko det’, ‘genitalia examined | by O. Gorbunov | preparation No 0058’, ‘Paratypus ♀ | Bembecia | rushana Gorbunov | det. O. Gorbunov 1990’, ZMUK. – Paratype 1♂ (Figs 1, 2, 22), same label data, ‘rushana Shel. | (allotyp.) | ♂ L. Sheljuzhko det’, ‘genitalia examined | by O. Gorbunov | preparation No 0059’, ‘Holotypus ♂ | Bembecia | rushana Gorbunov | det. O. Gorbunov 1990’, ZMUK. ♂ holotype of *Bembecia karategina* Špatenka, 1997 (Figs 3, 4, 23), ‘USSR Tadzhikistan | Karategin Ridge | Romit Vall. 1500 m | 69°10' E 38°40' N | 12. July 1981 | leg. J. A. Vaněk’, ‘Holotypus | Bembecia | karategina ♂ | K. Špatenka des.’, ‘Museum Witt | München’, genitalia examined by A. Lingenhöle, Museum Witt prep. 17291, MWM. – **Tajikistan:** Hissar-Alai: Khoja Ob-i Garm, 2350 m, N 38°53'19.9", E 68°45'08.9": 22♂ 18.vii.2009; 31♂ 1♀ 26.vii.2010; 136♂ 08.viii.2010 (Garrevoet prep. TG 2011-011, TG 2011-012) (Figs 25, 27) (CTG); 1♂ 18.vii.2010; 6♂ 29.vii.2010; 126♂ 2.viii.2010 (Bartsch prep. 2011-14) (Fig. 24) (CDB); 5♂ 18.vii.2009; 103♂ 2.viii.2011 (Lingenhöle prep. AL 257) (Fig. 26) (CAL); 2 km S of Anzob Pass, 2500 m, N 39°04'13.6", E 68°51'00.1": 1♂ 25.vii.2009; 7♂ 29.vii.2010; 61♂ 1♀ 23.vii.2011, 2♂ ex pupa 23.vii.2011, imagoes emerged 30.vii.2011 and 4.viii.2011; 6♂ 26.vii.2011; 4♂ (Figs 5, 6), 4♀ (Figs 13, 14), ex larva, 08.vii.2012, males emerged 2x 29.vii.2012, 30.vii.2012 and 10.viii.2012, females 02.viii.2012, 03.viii.2012 and 2x 05.viii.2012 (CTG); 5♂ 23.vii.2011, 2500–2700 m; 1♂ 3♀ (Figs 11, 12), ex pupa, 23.vii.2011, 2500 m, imagoes emerged 04.viii.2012, 05.viii.2012, 21.viii.2012, 01.ix.2012; 7♂ 1♀ (Bartsch prep. 2013-01) (Fig. 29) 24.vii.2011,

Figs 1–8. Males of *Bembecia rushana*, scale bars 10 mm (all specimens except for the types in CTG). **1, 2.** Paratype, Pamir, Rushan, Jugum, Jazgulem, fauces fl. Rav-dara (ZMKU). **3, 4.** Holotype of *Bembecia karategina*, Karategin range, Romit valley (MWM). **5, 6.** Yellow form, Hissar-Alai, 2 km S of Anzob Pass. **7, 8.** Black form, Peter the First Range, 50 km NE of Tavildara, Alisurkhon.



2850–3050 m; 1♂ 25.vii.2011, 3020 m (CDB); 36♂ 1♀ 25.vii.2011; 3♂ 25.vii.2011, ex larva, imagines emerged 07.ix.2011 (CAL); Pichev, 1950 m, N 39°02'25.9", E 69°23'02.2", 1♂ 21.vii.2009. Peter the First Range: 50 km NE of Tavildara, Alisurkhon, 1950 m, N 38°53'56.2" E 70°58'01.9", 19♂ (Figs 7, 8) (CTG) 3♂ (CDB) 14.vii.2011; Gowd, 1950 m, N 38°50'54.3" E 70°57'53.1", 36♂ 14.vii.2011 (CAL); 20 km NE of Tavildara, Sabzikharf, 1850 m, N 38°47'46.5", E 70°40'33.8", 1♂ 18.vii.2011 (CTG).

Description of the black form of *Bembecia rushana*. **Adults.** Male (Figs 7, 8). Similar to the yellow form, in size as well as in size and shape of transparent wing areas and discal spots. Body almost entirely black with bluish gloss. Labial palp dorsally and ventro-mesally more or less pale yellow; frons laterally yellow, at base of antenna some yellow scales; vertex with long grey-yellow scales. Anal tuft ventro-laterally sparsely orange-yellow. Forewing anal area and veins of external transparent area orange; underside of both wings with costal area and veins pale yellow. Female (Figs 13, 14). Larger than male, wingspan 22–27 mm. Body almost completely black with light bluish tinge. Labial palp dorsally yellow, ventrally and mesally some yellow scales; frons orange-yellow, medially dark grey; vertex and pericephalic scales orange-yellow, the latter ventrally pale yellow; foretibia and -tarsus ventrally yellow; anal tuft with some yellow scales ventrally; forewing underside with costal area pale yellow. Wings almost opaque; anterior transparent area of forewing and medio-basal part of hindwing slightly translucent, the former always visible as a very narrow slit and sometimes faintly indicated with some dark orange scales.

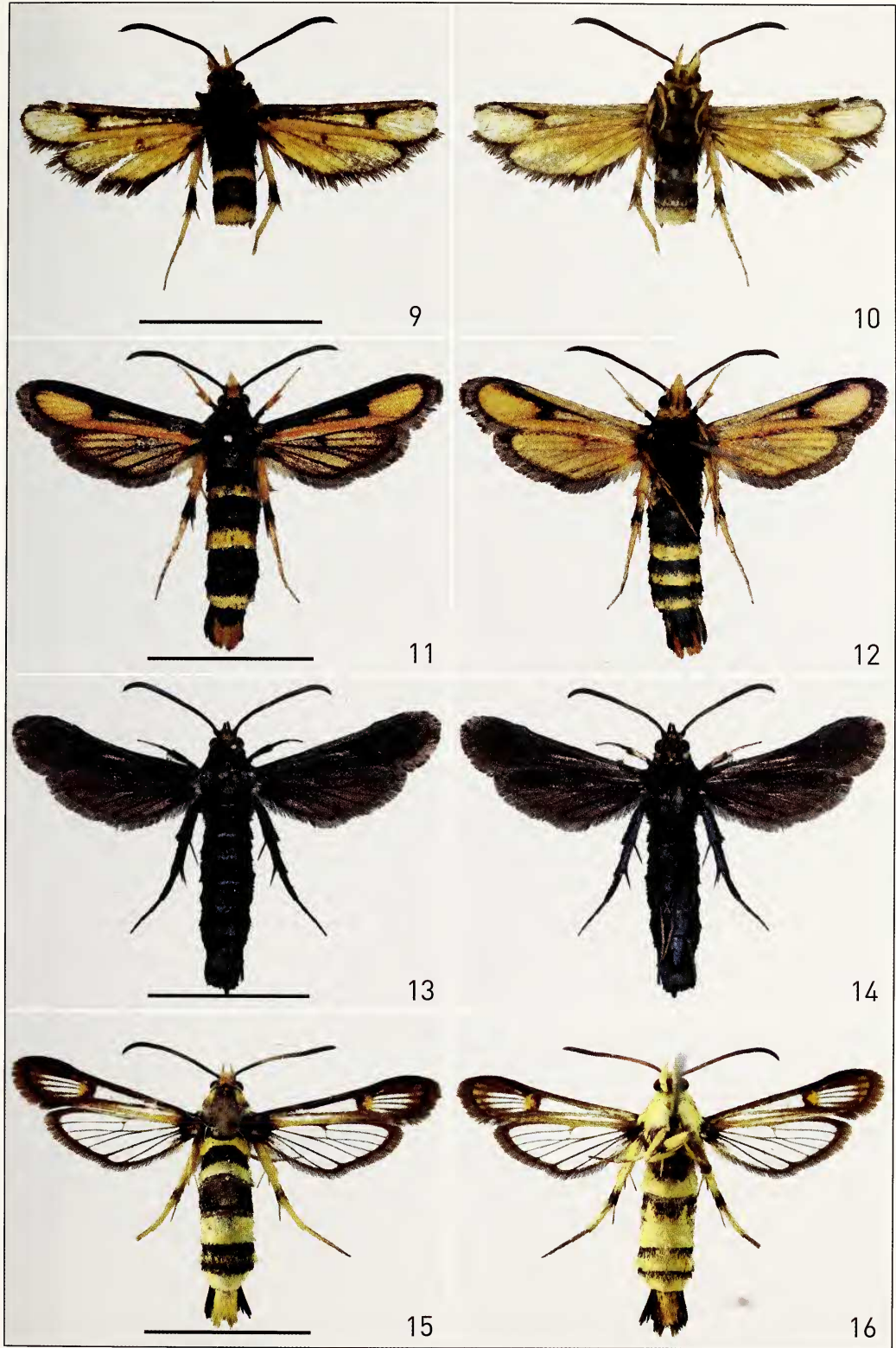
Male genitalia (Figs 22–27). Gnathos with lateral cristae relatively short, medial crista absent. Valva ovoid, apically rounded; crista sacculi straight, somewhat oblique, half as long as valva, distally slightly ventrad bent, arrangement of its setae very variable, often interrupted by a more or less distinct subdistal gap (Fig. 25 subdistal gap only on one side).

Female genitalia (Figs 28, 29). Antrum long and slender, ostium bursae minutely convex.

Variability. Yellow-coloured specimens vary little in colour intensity and extension. In older specimens of the dark form, the bright orange-yellow colouration of the head becomes bleached pale whitish yellow. One of the yellow females has an orange-yellow scapular spot at the forewing base. Differences in size are often related to the locality. Males from Khoja Ob-i Garm have a wingspan of 15–23 mm, whereas those from the southern ascent to Anzob Pass, which is only some 20 km distant, measure 19–26 mm. Also a dependence on different host plants may exist, as the confirmed host from the Anzob Pass was not observed in Khoja Ob-i Garm. In the males, the arrangement of the setae on the crista sacculi is unusually variable: the subdistal gap sometimes even varies within the genitalia of the same specimen (Fig. 25).

Diagnosis. *Bembecia rushana* belongs to the *B. ichneumoniformis* (Denis & Schiffermüller, 1775) species group and may be closely related to other central Asian species such as *B. afghana* Bartsch & Špatenka, 2010, *B. guesnoni* Špatenka & Toševski, 1993,

Figs 9–16. Females of *Bembecia* species. **9, 10.** *Bembecia rushana*, holotype, Pamir, Rushan, Jugum, Jazgulem, fauces fl. Rav-dara (ZMKU). **11, 12.** *Bembecia rushana*, yellow form, Hissar-Alai, 2 km S of Anzob Pass (CDB). **13, 14.** *Bembecia rushana*, black form, Hissar-Alai, 2 km S of Anzob Pass. **15, 16.** *Bembecia hissoensis*, paratype of *Bembecia karategina*, Karategin range, Romit valley (MWM).



B. lamai Kallies, 1996 and *B. zebo* Špatenka & Gorbunov, 1987, all of which lack a medial crista of the gnathos and have the crista sacculi of the valva straight and its setae with subdistal gap. *B. rushana* is easy to distinguish from all these species using only external morphological characteristics. In particular, the almost black thorax and first abdominal sternites (only scapular spot yellow) and the broad, almost black forewing discal spot are characteristic. *B. afghana* has abdominal tergite 2 without yellow margin and forewing discal spot yellow distally. *B. guesnoni* and *B. lamai* have abdominal tergite 2 with fine yellow posterior margin and forewing discal spot rather narrow, with distal yellow spot in *B. guesnoni* and discal spot completely yellow in *B. lamai*. In the Hissor-Alai, *B. rushana* often shares the habitat with the superficially rather similar *B. zebo*. This species differs in the smaller forewing discal spot with distinct yellow spot distally, the larger 5-partite external transparent area and the yellow sternite 2 (discal spot without yellow spot, external transparent area 3 or 4 partite, sternite 2 black in *B. rushana*). Also superficially similar, but with a flight period in May/June being much earlier on the wing is *B. kreuzbergi*, which is clearly separated by having the metathorax yellow dorsally. Further species, often occurring syntopically and synchronously, are *B. aye* Stalling, Altermatt, Lingenh le & Garrevoet, 2010, *B. tshimgana* (Sheljuzhko, 1935), *B. lingenhoelei* Garrevoet & Garrevoet, 2011 and *B. hissorensis*. Both the yellow and black forms of the males of *B. aye* are distinctly larger than *B. rushana* and have forewing veins and margins red anteriorly and external transparent area very large, consisting of 5 cells (wings without red, external transparent area 3 or 4 celled in *B. rushana*). The female of *B. aye* is unknown. Richly yellow marked forms of the very variable *B. tshimgana* are unmistakable in having the forewing discal spot completely orange yellow. Dark forms have a black forewing discal spot, sometimes centrally with small orange dot or a few orange-yellowish scales. They differ from black *B. rushana* in having some tergites and the hindtibia with yellow markings, which are sometimes difficult to discern. Males of *B. tshimgana* differ further in the smaller forewing discal spot, which is nearly as broad as the apical area. Females of *B. tshimgana* have well developed transparent areas of the forewings and the hindwings transparent (both wings opaque in *B. rushana*). Males of *B. lingenhoelei* have smaller transparent areas and only the abdominal tergites 4 and 6 with narrow yellow posterior margin (tergite 2 with narrow, 4, 6 and 7 with broad yellow margin in *B. rushana*). Females of *B. lingenhoelei* are also black but lack the orange-yellow colouration of the head, the forewing lacks transparent areas and has the apex slightly translucent (anterior transparent area very small, but always visible, wing apex intensely black in *B. rushana*). Both sexes of *B. hissorensis* differ in having the tegula cranially, the metathorax dorsally and the sternite 2, 4–6 (and 7 in male) yellow and the forewing discal spot with distinct yellow spot distally, the female is further distinguished by the well developed transparent parts of the wings. Very similar, especially in the female, is *B. salangica* from the Hindu Kush, Afghanistan. This species also has yellow and

Figs 17–21. Habitat and host plants of *Bembecia* species. **17.** Tajikistan, Hissar-Alai, 2 km S of Anzob Pass, habitat of *B. rushana*, *B. hissorensis*, *B. aye*, *B. lingenhoelei* and *B. zebo*. **18, 19.** *Astragalus* sp. host plant of *B. rushana*. **20, 21.** *Astragalus* sp. host plant of *B. hissorensis*; dry leaves showing presence of larva (right).



black forms. The yellow form of the males has the colouration of the body paler, the posterior margin of the tergites narrower and present only on tergites 2, 4 and 6, both forms have the vertex covered with dense, extremely hair-like, greyish scales, and lack the longitudinal transparent area of the forewing. Pale females have the vertex black, tergite 5 with broad yellow posterior margin and the hindwing discal spot rather indistinct (vertex orange, without hair-like scales; tergite 5 and hindwing discal spot black in *B. rushana*), black females of *B. salangica* lack the orange-yellow colouration of the head. There is no phenotypic similarity between *B. rushana* and *B. tancrei* (Püngeler, 1905) as stated by Špatenka et al. (1999). *B. tancrei* is darker and other clear differences are in the narrower abdominal annulations, almost black anal tuft, narrower forewing discal spot, and presence of longitudinal and larger anterior and external transparent areas, the latter consisting of 6 cells.

Bionomics. *Bembecia rushana* occurs in dry, stony, often southwards exposed slopes, abrasions and road sides with sparse, predominantly herbaceous vegetation at altitudes from about 2000 m up to 3500 m (Fig. 17). The larva lives apparently two years in the root of an undetermined, non-acanthous species of *Astragalus* L. (Fabaceae) (Fig. 18). In July, infested plants attract attention by the presence of a lot of dry or yellow leaves (Fig. 19). At the time of collection, many larvae had already pupated. Some smaller larvae, not having made their pupal chamber by the end of July apparently needed a second overwintering to complete development. Prior to pupation, the larva constructs a short almost invisible exit tube from the root to the soil surface. The pupal chamber is inside, or along the upper part of the root. Emergence of the imagines always took place in the morning. The species starts to fly in mid-July at altitudes around 2000 m and one or two weeks later at higher altitudes. In culture one male emerged on September 1 and further three males on September 7, indicating a long flight period of the adults, with its maximum likely in the first half of August. Males are active from late morning to early afternoon. Females were captured in early afternoon flying near the host plant.

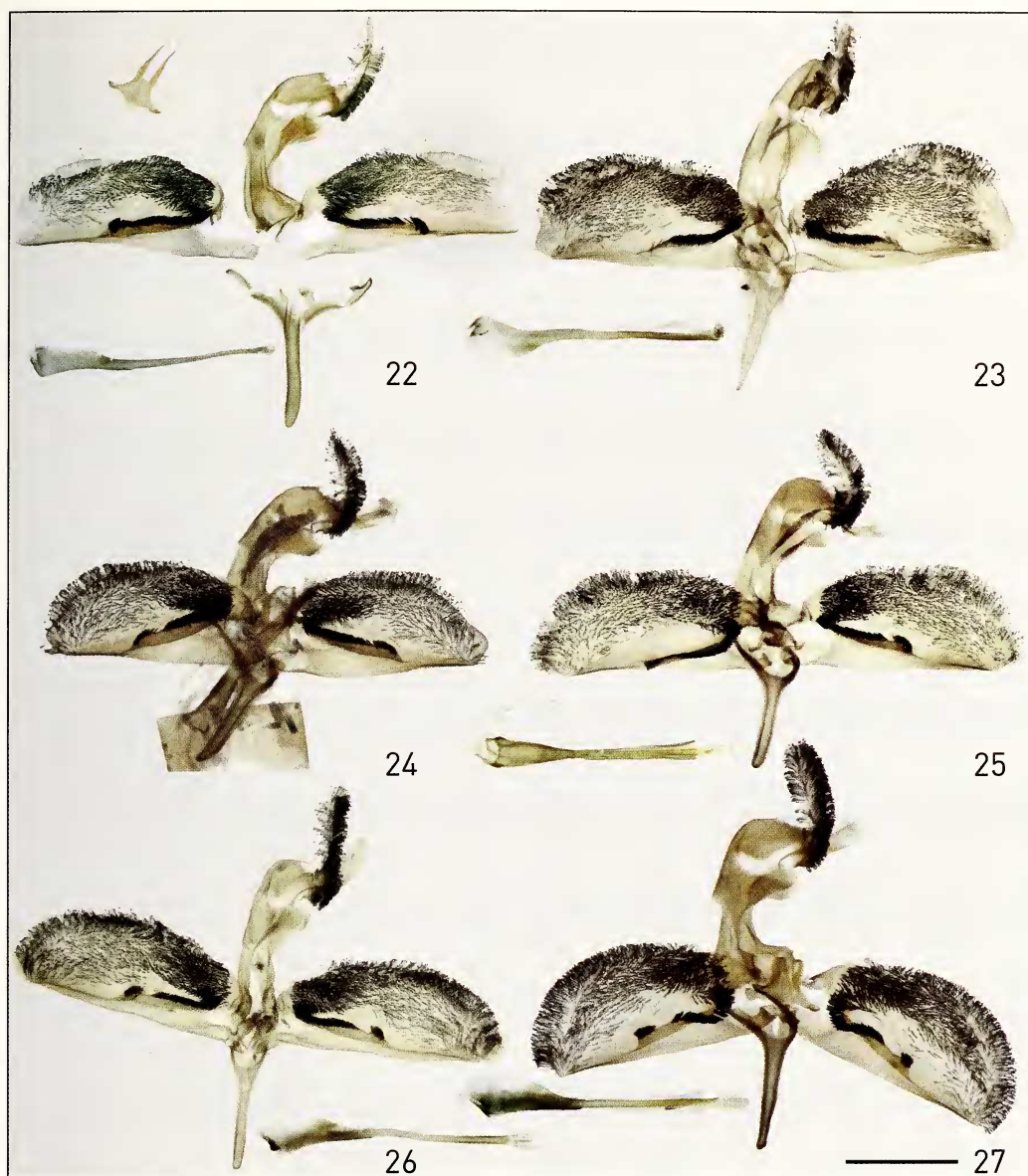
Distribution. *Bembecia rushana* is only known from the type locality in the Western Pamir close to the Afghan border, the Peter the First Range in the north-western Pamir and the Hissar-Alai north and east of Dushanbe. All localities are in Tajikistan south of the main range of the Hissar-Alai, which is a distinct faunal boundary line and apparently represents the northern limit of its distribution. Records of *B. rushana* from Afghanistan (Bartsch & Špatenka 2010; Špatenka et al. 1999) refer to *B. salangica*. However, the localities of several finds, including that of the types, are very close to the Afghan border making the occurrence in Afghanistan very likely.

Species confused with *Bembecia rushana*

***Bembecia hissorensis* Stalling, Bartsch, Garrevoet,
Lingenhölle & Altermatt, 2011**

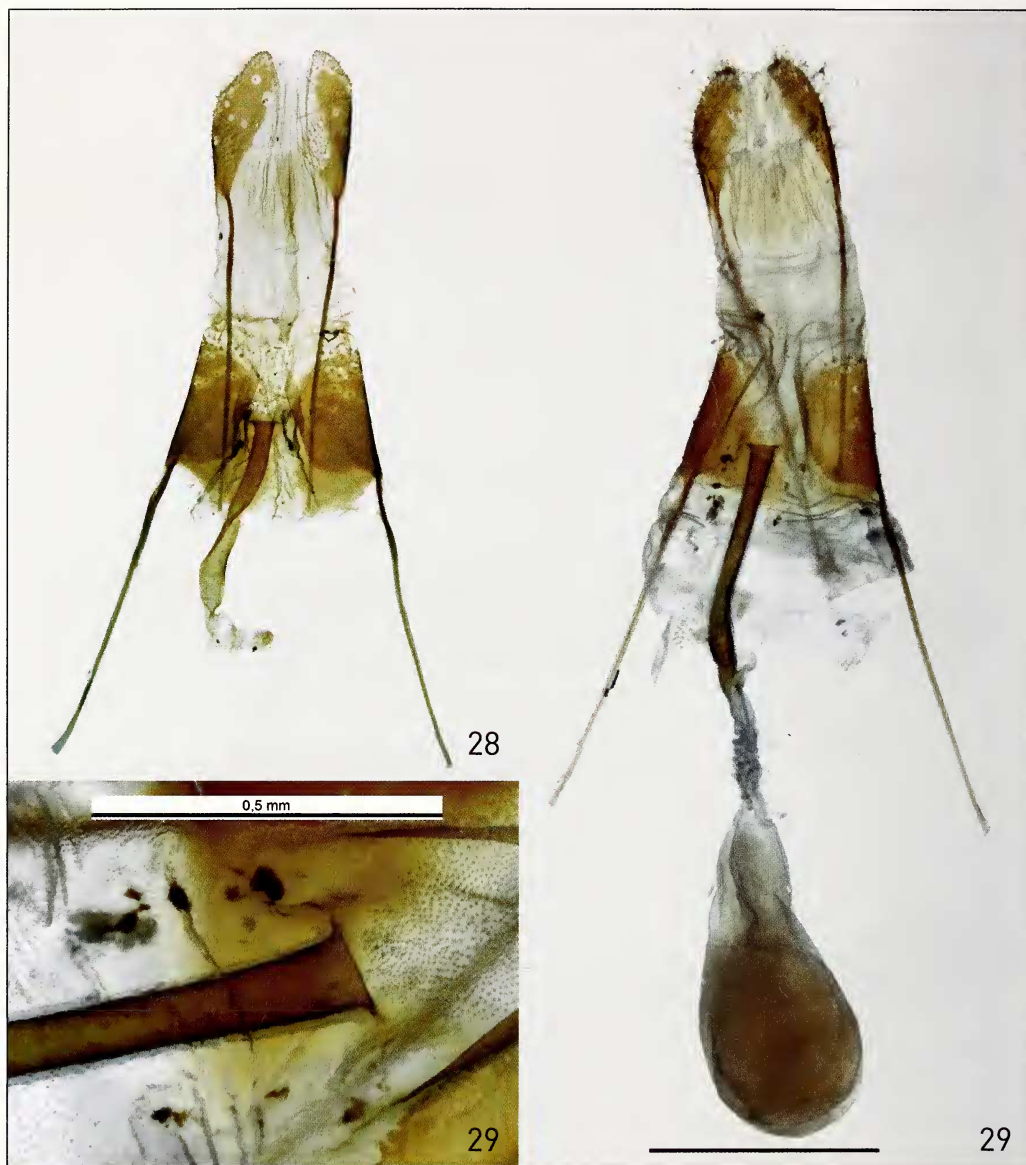
Figs 15, 16

Bembecia hissorensis Stalling, Bartsch, Garrevoet, Lingenhölle & Altermatt 2011: 169. Type locality: Tajikistan, Hissar-Alai, 10 km NW Hissor, N 38°37'42", E 68°25'33", 1800 m, 13.vii.2010. Holotype: male (SMNS).



Figs 22–27. Genitalia of *Bembecia rushana* males. 22. Paratype (ZMKU). 23. Holotype of *Bembecia karategina* (MWM). 24–27. Specimens from Khoja Ob-i Garm, showing variability of crista sacculi (CTG, CDB, CAL).

Bembecia hissorensis was described from a large series of 292 males, which were captured in the Hissar-Alai north and south of the main range. Despite the local abundance of the males, female and host plant were unknown. The female paratype of *B. karategina* (Figs 15, 16) belongs to *B. hissorensis*. This is supported by the widely analogous pale yellow colouration shared with the males and from DNA analysis (Fig. A1). This is the only known female of this species and, as *B. karategina*, has been well described and figured in the recent literature (Špatenka 1997, Špatenka et al. 1999). The host



Figs 28, 29. Genitalia structure of *Bembecia rushana* females. 28. Holotype (ZMKU). 29. Specimen from Anzob Pass, insert: ostium (CDB).

plant on the south side of the Anzob Pass is a very small, hairy, non-acanthous species of *Astragalus* L. (Figs 20, 21), apparently near *Astragalus heydei* Baker. Only very few larvae/pupae have been found, from which two males emerged.

Bembecia salangica Špatenka & Reshöft, 1989

(not figured)

Bembecia salangica Špatenka & Reshöft, 1989: 178. Type locality: Afghanistan, north side of Salang Pass, 3400 m, 14.vii.1974. Holotype: female (MWM).

Bembecia salangica was described from five females from the Salang Pass, Hindu Kush Mountains. Further specimens were discovered at some other localities in the Hindu Kush, including males, which were described from one specimen from the Anjuman Pass and one from the Comar Valley (Bartsch & Špatenka 2010, Špatenka 1992). Two females from the first locality are figured at the “Barcode of Life” web pages, one of them as *B. rushana*. This is the specimen mentioned and illustrated in the “Handbook of Palearctic Macrolepidoptera” misidentified as *B. rushana*, representing this species in Afghanistan (Špatenka et al. 1999).

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References

- Bartsch, D. & K. Špatenka 2010. *Bembecia magnifica* und *Bembecia afghana*, zwei neue Glasflügler aus Afghanistan (Lepidoptera: Sesiidae). – Entomologische Zeitschrift **120**: 243–248.
- BOLD web pages (<http://www.barcodinglife.com/views/login.php>).
- Garrevoet, T. & W. Garrevoet 2011. *Bembecia lingenhoelei*, a new clearwing moth from Tajikistan (Lepidoptera: Sesiidae) – Phegea **39**: 73–79.
- Garrevoet, T. & A. Lingenhöle 2011. *Bembecia bartschi*, a new clearwing moth from Tajikistan (Lepidoptera: Sesiidae) – Entomologische Zeitschrift **121**: 157–161.
- Gorbunov, O. 1992a. Revision of the types of the Sesiidae (Lepidoptera), preserved in the collection of the Zoological Museum of Kiev State University. – Entomologicheskoe Obozrenie 71: 121–133. [In Russian; English translation in Entomological Review **72**: 40–53; 1993].
- Gorbunov, O. 1992b. Two new species of the genus *Bembecia* Hübner, 1819 from Middle Asia (Lepidoptera, Sesiidae). – Atalanta **23**: 249–253.
- Lingenhöle, A. & D. Bartsch 2011. *Bembecia garrevoeti* sp. nov. aus dem östlichen Hissargebirge in Tadschikistan (Lepidoptera: Sesiidae) – Entomologische Zeitschrift **121**: 163–167.
- Špatenka, K. & K. Reshōft 1989. Eine neue Art der Gattung *Bembecia* Hübner, 1819 aus Ost-Afghanistan (Lepidoptera, Sesiidae). – Entomofauna **10**: 177–186.
- Špatenka, K. 1992. Weitere neue paläarktische Sesiiden (Lepidoptera Sesiidae). – Alexanor **17**: 427–446.
- Špatenka, K. 1997. Neue Glasflügler (Lepidoptera, Sesiidae) aus dem Pamir und dem Hindukusch. – Bonner Zoologische Beiträge **47**: 31–44.
- Špatenka, K., O. Gorbunov, Z. Laštuvka, I. Toševski & Y. Arita 1999. Sesiidae – Clearwings moths. 569 pp. – In: C. Naumann (ed.), Handbook of Palearctic Macrolepidoptera 1. – GEM Publishing Company, Wallingford, England.
- Stalling, T., F. Altermatt, A. Lingenhöle & T. Garrevoet 2010. A new species of *Bembecia* Hübner, [1819] from Tajikistan, Central Asia (Lepidoptera: Sesiidae) – Entomologische Zeitschrift **120**: 249–251.
- Stalling, T., D. Bartsch, T. Garrevoet, A. Lingenhöle & F. Altermatt 2011. *Bembecia hissoresensis*, a new species of Clearwing moths from Tajikistan, Central Asia (Lepidoptera: Sesiidae). – Entomologische Zeitschrift **121**: 169–172.

Appendix

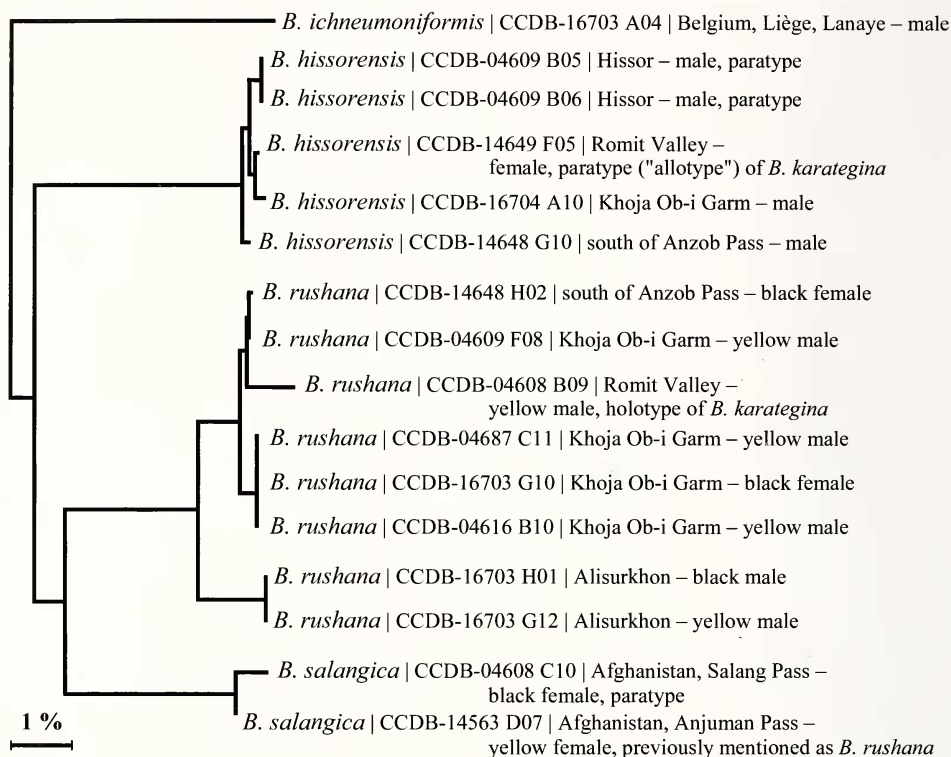


Fig. A1. Neighbour joining tree of DNA barcodes of *Bembecia* species, showing specimen registry numbers and localities of origin (all specimens from Tajikistan, unless stated otherwise). *B. ichneumoniformis* (Denis & Schiffermüller, 1775) is the outgroup.